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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/705,500	11/12/2003	Ya-Lun Cheng	82546	4755
20529	7590	08/12/2004	EXAMINER	
NATH & ASSOCIATES 1030 15th STREET 6TH FLOOR WASHINGTON, DC 20005			MALSAWMA, LALRINFAMKIM HMAR	
			ART UNIT	PAPER NUMBER
			2825	

DATE MAILED: 08/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/705,500

Applicant(s)

CHENG ET AL.

Examiner

Lex Malsawma

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-25 is/are allowed.
- 6) ☒ Claim(s) 1,8,9 and 15-19 is/are rejected.
- 7) ☒ Claim(s) 2-7 and 10-14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

On page 6, line 3, after “chemical vapor deposition”, “CMP” should read “CVD”.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
4. Claims 1, 8, 9 and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu (6,087,235) in view of Deckert et al. (4,269,654; hereinafter, “Deckert”).

Regarding claims 1, 8, 9 and 15-19:

Yu discloses (in Figs. 4-6 and Col. 2, lines 35-61) a method for preventing the formation of a spacer undercut in SEG pre-clean process, comprising:

providing a semiconductor substrate 102;

forming a gate structure 204 on said semiconductor substrate;

forming a spacer of double-film structure on a side-wall of said gate structure, wherein said spacer comprises a first spacer 212 (of oxide, e.g., silicon dioxide) and a second spacer 210 (of silicon nitride), said first spacer being formed between said side-wall of said gate structure and said second spacer; and

forming a raised source/drain (214, 216) by selective epitaxial growth (SEG) on the surface of the semiconductor substrate after etching the first and second spacers.

Yu **lacks** specifying a process for forming the double-film structure, accordingly, Yu lacks removing a portion of a surface of said semiconductor substrate and etching said first spacer and said second spacer, wherein an etching rate of said second spacer is faster than an etching rate of said first spacer. Deckert **teaches** a process for etching a composite structure comprising silicon nitride and silicon oxide, wherein the etching is performed with an etching solution comprising HF diluted by ethylene glycol (HFEG) such that the silicon nitride can be etched faster than (or equally as fast as) the silicon oxide (note abstract, Col. 2, lines 17-24, and Col. 5, lines 31-33). Note that Deckert discloses that prior etching processes can leave undercuts because silicon oxide is etched much faster than silicon nitride (Col. 1, lines 35-49, note especially, line 48). Since Yu does not specify a process for etching the spacer materials or how the double-film spacer structure is formed without an undercut (as shown in Figs. 5-6), it would

have been obvious to one of ordinary skill in the art modify Yu by utilizing an etching process/solution taught by Deckert because the HFEG solution would etch the silicon nitride (i.e., the second spacer) faster than the silicon oxide (i.e., the first spacer) such that an undercut will be prevented (as shown in Figs. 5-6 of Yu). It is noted that native oxide readily forms on a silicon substrate unless a dedicated process is performed to specifically prevent native oxide from forming during each step leading up to the formation of the spacer structure; therefore, a native oxide would obviously exist on the surface of the substrate, since Yu does not disclose any steps for preventing native oxide from forming on the substrate. Accordingly, an HFEG solution utilized by Yu (in view of Deckert) would remove native oxide on a surface of the substrate during the etching process for forming the double-film spacer structure. Therefore, the instant claims are held obvious over the cited references.

Allowable Subject Matter

5. Claims 2-7 and 10-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. Claims 10-25 are allowable over the references of record.

7. The following is a statement of reasons for the indication of allowable subject matter:

Claims 2-7 and 10-14 would be allowable primarily because claims 2 and 10 require removing the portion of the substrate surface utilizing a DHF solution along with etching the first

and second spacers at “different” rates in order to prevent the formation of a spacer undercut (as required by the preamble).

Claims 10-25 are allowable primarily because claim 20 requires a combination of a first cleaning using DHF solution followed by a second cleaning using HFEG such that a spacer undercut is prevented. In other words, the DHF will form an undercut in the silicon dioxide (first spacer) but the HFEG would essentially eliminate the undercut by etching the silicon nitride (second spacer) faster than the silicon dioxide (the first spacer). Such a cleaning/etching process within a SEG process for forming a raised source/drain cannot be anticipated or rendered obvious by the references of record.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The references listed on the attached Form PTO-892 (not cited above) are cited to show SEG processes, etching with DHF, etching with HFEG, etc.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lex Malsawma whose telephone number is 571-272-1903. The examiner can normally be reached on Mon-Fri (6AM-2PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2825

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lex Malsawma



August 8, 2004



MATTHEW SMITH
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